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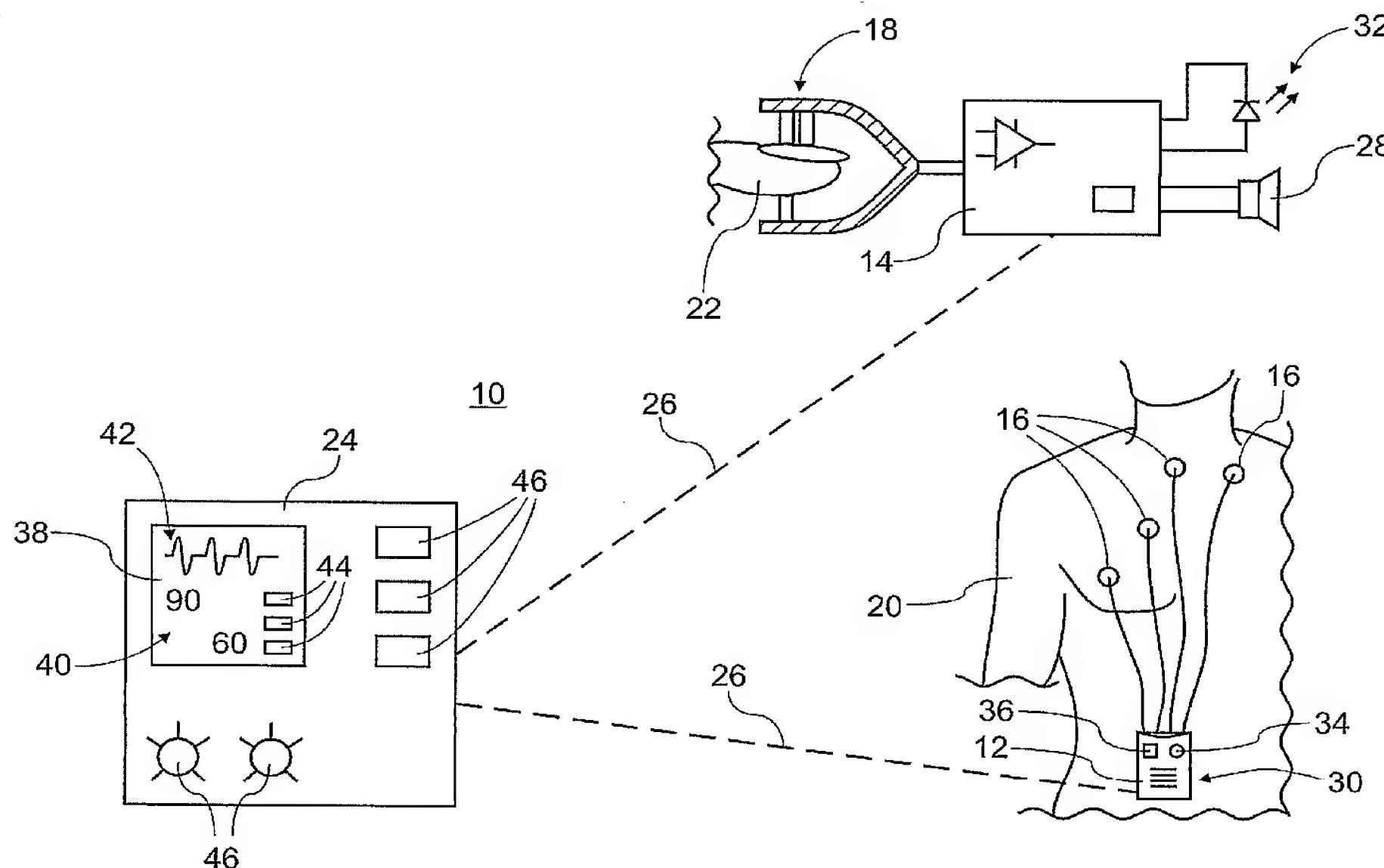
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(54) Title: MEDICAL MEASURING DEVICE



(57) **Abstract:** The invention relates to a medical measuring device (10) comprising at least one measuring apparatus (12, 14), which has at least one sensor (16, 18) for generating a measuring signal of a patient (20, 22). A measuring data detection device (24) is also provided, which is designed to exchange measuring signals with the at least one measuring apparatus (12, 14) via an, in particular, wireless communication route (24, 26). The at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Medical measuring device

The invention relates to a medical measuring device according to claim 1.

Instead of stationary and large measuring apparatuses, small and mobile
5 apparatuses are used more and more frequently in the medical sector, which can be carried by patients and therefore allow greater freedom of movement. An autonomous ECG recorder is known, for example, from US 5,433,209 and is designed as a portable apparatus allowing leads-off detection and alarm actuation on the portable apparatus which is implemented automatically according to a fixed sequence once the apparatus has been switched on.

10 Mobile devices of this type are generally optimized with respect to a small size and low power consumption. They therefore do not generally have detailed displays, but only small displays designed for the basic functions such as on/off or the battery status.

15 Devices of this type are increasingly no longer used as autonomous units, but as remote units for measuring data detection in a distributed measuring and measuring data detection system. These units then communicate with a stationary apparatus via a generally wireless communication connection, via which measuring signals are transmitted from a remote unit or a measuring apparatus to the stationary apparatus or the measuring data detection device.

20 However, when sensors of the remote units are placed on the body of a patient, medical staff cannot generally see a stationary apparatus with its detailed displays located in another room. Therefore they have no information about the correct placing on the body of the patient with respect to good quality of the measuring signals. For this purpose, the staff have to go to the stationary apparatus once the sensors have been placed and check the measuring signal quality. However, this is very time-consuming.

25 A further problem is that directly after the placing of sensors of a remote unit, the measuring signal quality is frequently very good but some time later deteriorates. It is therefore generally necessary for medical staff to check the measuring signal quality from time to time at the stationary apparatus. However, this is also very time-consuming.

An object of the present invention is therefore to propose a medical measuring device which is easier for medical staff to handle than the devices described at the outset, in particular requiring less time for monitoring.

5 This object is achieved by a medical measuring device with the features of claim 1. Further configurations emerge from the dependent claims.

An essential concept of the invention consists in signaling the measuring signal quality from a sensor directly at the measuring apparatus, to which the sensor is connected. Medical staff are therefore spared the time-consuming checking of the quality of 10 the measuring signals at a central unit like the measuring data detection device.

The invention relates to a medical measuring device with at least one measuring apparatus which has at least one sensor for generating a measuring signal of a patient, and a measuring data detection device, which is designed to exchange the measuring signal with the at least one measuring apparatus via an, in particular, wireless communication 15 route, wherein the at least one measuring apparatus is designed to signal the quality of the measuring signal.

The at least one measuring apparatus is designed, in particular, to signal the quality of the measuring signal acoustically, for example by a short audio signal, when the signal quality is poor. The audio signal can thus be changed depending on the signal quality, 20 for example it may be repeated very often in the case of very poor signal quality. Typically no audio signal is sounded when the signal quality is adequate or good.

Alternatively or in addition, the at least one measuring apparatus can be designed to signal the quality of the measuring signal optically, for example by a display with LEDs or on an LCD.

25 The at least one measuring device is preferably a light means with different colors, each color being associated with a predetermined range of a signal quality and activated when the quality of the measuring signal is in the corresponding, predetermined range.

The light means may also be, for example, a three-colored LED, three 30 different colors being provided for a range of poor quality, a range of medium and a range of high quality. Red may be, for example, poor, yellow medium and green good signal quality.

The at least one measuring apparatus is preferably designed to signal the quality of the measuring signal automatically. In this case no activation of a signalization of the measuring signal quality is necessary by medical staff.

The at least one measuring apparatus may be designed, for example, to signal the quality of the measuring signal when it is placed on a patient at another measuring site. In other words, it is triggered automatically when the measuring site is changed and signals the signal quality.

5 In addition or also alternatively, the at least one measuring apparatus can be designed to signal the quality of the measuring signal, if a substantial change in the quality of the measuring signal is detected, for example when a patient has removed one or more sensors.

10 The at least one measuring apparatus can also be designed to signal the quality of the measuring signal on demand, for example by pressing a button on the measuring apparatus or by a corresponding demand from the measuring data detection device.

15 In a simple embodiment, the at least one measuring apparatus is designed to signal the quality of the measuring signal in such a way that falling below a predetermined signal quality is signaled. In other words there is a threshold value in the form of the predetermined signal quality. The falling below of the threshold value can be detected by a 20 comparator in the measuring apparatus and trigger or activate signaling.

For preferred application areas in the medical sector, the at least one measuring apparatus is designed to signal the quality of the measuring signal on the basis of an evaluation of one or more parameters such as the perfusion index, transmission level, 25 interference level, the signal form or the like.

The at least one measuring apparatus is preferably a pulsoximeter, an ECG recorder and/or ultrasound measuring head.

25 Further advantages of the application possibilities of the present invention emerge from the following description of an embodiment of the invention with the single drawing.

30 The single Figure of the drawing shows a medical measuring device 10 in the form of a distributed medical measuring system with measuring apparatuses 12 and 14 and a central measuring data detection device 24 which is used for storing and displaying medical measuring data and for central control of the measuring apparatus 12 and 14.

The measuring data detection device 24 comprises an LCD display screen 38 for displaying medical measuring data. The medical measuring data comprise, for example, a curve pattern 42 and numerical values 40 for measuring values. The measuring data detection device 24 has various operating elements 46 for adjusting measuring parameters, the display 5 on the screen 38 and functions of this type of the measuring data detection device 24.

The measuring device 12 is a portable ECG measuring apparatus which has a plurality of ECG electrodes 16 as sensors. As shown in the Figure, a patient 20 carries the ECG measuring apparatus 12 on his upper body, on which the ECG electrodes 16 are fastened. The ECG measuring device 12 has an ECG recorder for recording the ECG signals 10 picked up via the ECG sensor 16. It also comprises a radio unit, with which it can build up a radio communication connection 26 with the measuring data detection device 24 for transmitting measuring signals.

To facilitate the correct placing of the ECG electrodes 16 on the upper body of the patient 20 for medical staff, the ECG measuring apparatus 12 has a three-colored LED 34 15 and a loudspeaker 30. The LED 34 and the loudspeaker 30 are used for optical or acoustic signaling of the quality of measuring signals which are captured via the ECG electrodes 16.

When the ECG measuring apparatus 12 detects that no measuring signal with adequate quality can be received via the ECG electrodes 16, it switches the color of the LED 34 to red to display a poor or lesser signal quality. Furthermore, an acoustic signal in the 20 form of a short periodic audio signal sounds over the loudspeaker 30 for as long as the signal quality is not adequate.

The signal quality is checked fully automatically in the ECG measuring apparatus 12, as soon as it is switched on. It is also possible to start a test of the signal quality by actuating a signal quality test button 36 on the ECG measuring apparatus 12. This may be 25 carried out, for example, by the patient 20 himself. When the signal quality is adequate, the ECG measuring device 12 transmits measuring signals of the ECG electrodes 16 via the radio communication connection 26 to the measuring data detection device 24 which shows the signals received, for example in the form of the curve pattern 42 on the large LCD display screen 38 and records the course of the measuring signals.

30 The measuring apparatus 14 is a pulsoximeter and connected to a pulsoximeter sensor 18, in which one finger 22 of the patient is located. The measuring signals of the sensor 18 are transmitted to the pulsoximeter measuring apparatus 14. The measuring apparatus comprises a comparator for comparing the signal quality of the measuring signals received with the predetermined threshold value for a predetermined signal quality. When the

signal quality received is less than the predetermined threshold value, the comparator output signal activates an LED 32 and an audio signal generator which controls the loudspeaker 28 with an audio signal. In this case, there is therefore optical and acoustic signaling that the quality of the signal of the pulsoximeter sensor 18 is not adequate to ensure reliable recording 5 in the measuring data detection device 24.

The signal quality can then be changed by the patient or medical staff by changing the position of the pulsoximeter sensor 18 in order to receive an adequate signal quality. When the signal quality is adequate, the measuring signals are transmitted from the pulsoximeter measuring apparatus 14 via a radio communication connection 26 to the 10 measuring data detection device 24 which displays the measuring signals received in the form of numerical values on the screen 38 and records them.

LIST OF REFERENCE NUMERALS:

10 medical measuring device
12 ECG measuring apparatus
14 pulsoximeter
16 ECG electrodes
5 18 pulsoximeter sensor
20 patient
22 finger of a patient
24 measuring data detection device
26 radio communication connection
10 28, 30 loudspeaker
32, 34 LED
36 signal quality test button
38 LCD display screen
40 numerical values
15 42 curve pattern
46 operating elements

CLAIMS:

1. A medical measuring device (10) comprising at least one measuring apparatus (12, 14), which has at least one sensor (16, 18) for generating a measuring signal of a patient (20, 22) and a measuring data detection device (24) which is designed to exchange measuring signals with the at least one measuring apparatus (12, 14) via an, in particular, wireless communication route (24, 26), wherein the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals.
5
2. A medical measuring device as claimed in claim 1, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals acoustically (28, 30).
10
3. A medical measuring device as claimed in claim 1 or 2, characterized in that the at least one measuring apparatus is designed to signal the quality of the measuring signals optically (32, 34).
15
4. A medical measuring device as claimed in claim 3, characterized in that the at least one measuring apparatus has a light means (32, 34) with different colors, each color being associated with a predetermined range of a signal quality and activated when the quality of the measuring signals is in the correspondingly predetermined range.
20
5. A medical measuring device as claimed in claim 4, characterized in that three different colors are provided for a range of poor quality, a range of medium and a range of high quality of the measuring signals.
25
6. A medical measuring device as claimed in any one of the preceding claims, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals automatically.

7. A medical measuring device as claimed in claim 6, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals when it is placed on a patient at another measuring site.

5 8. A medical measuring device as claimed in claim 6 or 7, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals, when a substantial change in the quality of the measuring signals is detected.

10 9. A medical measuring device as claimed in any one of the preceding claims, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals on demand (36).

15 10. A medical measuring device as claimed in any one of the preceding claims, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals in such a way that falling below a predetermined signal quality is signaled.

20 11. A medical measuring device as claimed in any one of the preceding claims, characterized in that the at least one measuring apparatus (12, 14) is designed to signal the quality of the measuring signals on the basis of an evaluation of one or more parameters such as perfusion index, transmission level, interference level, the signal form or the like.

25 12. A medical measuring device as claimed in any one of the preceding claims, characterized in that the at least one measuring apparatus is a pulsoximeter (14, 18), an ECG recorder (12, 16) and/or ultrasound measuring head.

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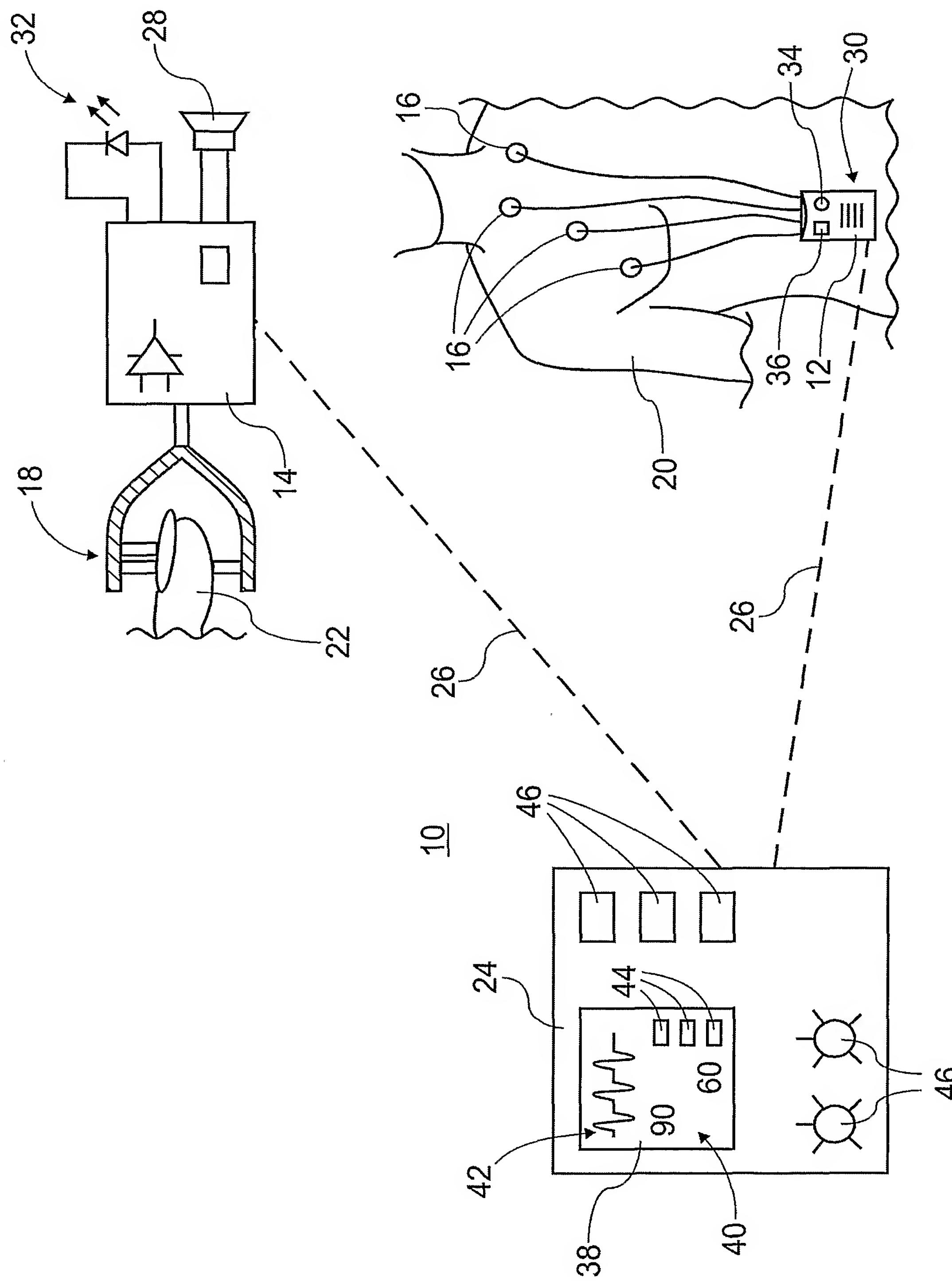


Fig.

INTERNATIONAL SEARCH REPORT

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 415 166 B1 (BRASHEARS MICHAEL K ET AL) 2 July 2002 (2002-07-02) column 3, line 6 – line 12 column 4, line 33 – line 48 column 5, line 63 – column 6, line 3 -----	1,3,6-8, 10-12
A	US 2003/120164 A1 (RYZIN PATRICK A VAN ET AL) 26 June 2003 (2003-06-26) paragraphs '0029!, '0048!, '0081! -----	4,5
X	US 2002/161291 A1 (CAROTHERS DON ET AL) 31 October 2002 (2002-10-31) paragraph '0084! paragraph '0085!, first sentence figure 1c -----	1,3,6-8, 10-12
		4,5
X	US 2002/161291 A1 (CAROTHERS DON ET AL) 31 October 2002 (2002-10-31) paragraph '0084! paragraph '0085!, first sentence figure 1c -----	1,3,9, 11,12
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Inte
nal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 170 791 A (BOOS ANDREAS ET AL) 15 December 1992 (1992-12-15) column 2, line 21 – line 26 column 3, line 49 – line 64 ----- US 2002/035315 A1 (BREED DIVYA S ET AL) 21 March 2002 (2002-03-21) paragraph '0090! -----	1,3-8, 10-12
A		1,2

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/IB2004/052511

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 6415166	B1	02-07-2002	US	2004102687 A1		27-05-2004
US 2003120164	A1	26-06-2003	DE	10259780 A1		03-07-2003
			FR	2834628 A1		18-07-2003
			JP	2003220045 A		05-08-2003
US 2002161291	A1	31-10-2002	US	6770028 B1		03-08-2004
			US	6584336 B1		24-06-2003
			EP	1309270 A1		14-05-2003
			WO	0215781 A1		28-02-2002
			US	2002140675 A1		03-10-2002
			US	2003197679 A1		23-10-2003
			AU	2859600 A		07-08-2000
			CA	2358454 A1		27-07-2000
			EP	1148809 A1		31-10-2001
			JP	2002535026 T		22-10-2002
			WO	0042911 A1		27-07-2000
US 5170791	A	15-12-1992	NONE			
US 2002035315	A1	21-03-2002	US	6606511 B1		12-08-2003
			EP	1389945 A2		25-02-2004
			JP	2004528913 T		24-09-2004
			WO	02091918 A2		21-11-2002
			US	2004133087 A1		08-07-2004
			EP	1139858 A1		10-10-2001
			JP	2002534146 T		15-10-2002
			WO	0040147 A1		13-07-2000